

# 2021 POWER PLAN ENERGY EFFICIENCY SUPPLY CURVE REVIEW

PREPARED FOR BPA  
AUGUST 2020

CADMUS



LIGHTHOUSE ENERGY  
— CONSULTING —



# Agenda

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Project Overview

Draft 2021 Plan Results

Next Steps & Resources

Questions



# PROJECT OVERVIEW

# Project Overview

## BPA ENGAGEMENT

Supply curve technical review

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Provide input through advisory committees and other meetings

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Begin planning for targets

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Provide comments from BPA's perspective

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## POWER COUNCIL PROCESS

Supply Curve  
Development

Modeling &  
Scenarios\*

Draft Plan

Public  
Comment

Final Plan

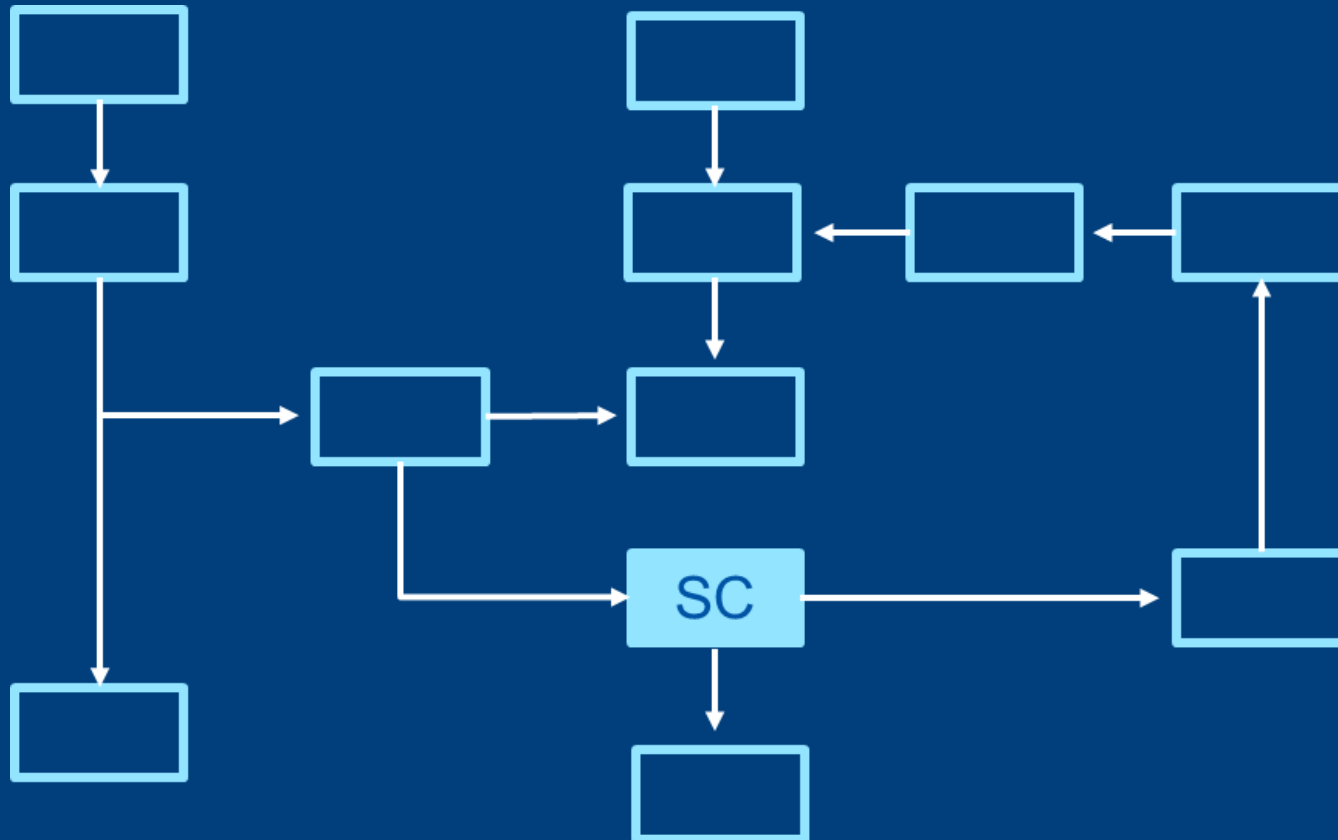
## BPA PROCESS

CPA & DRPA

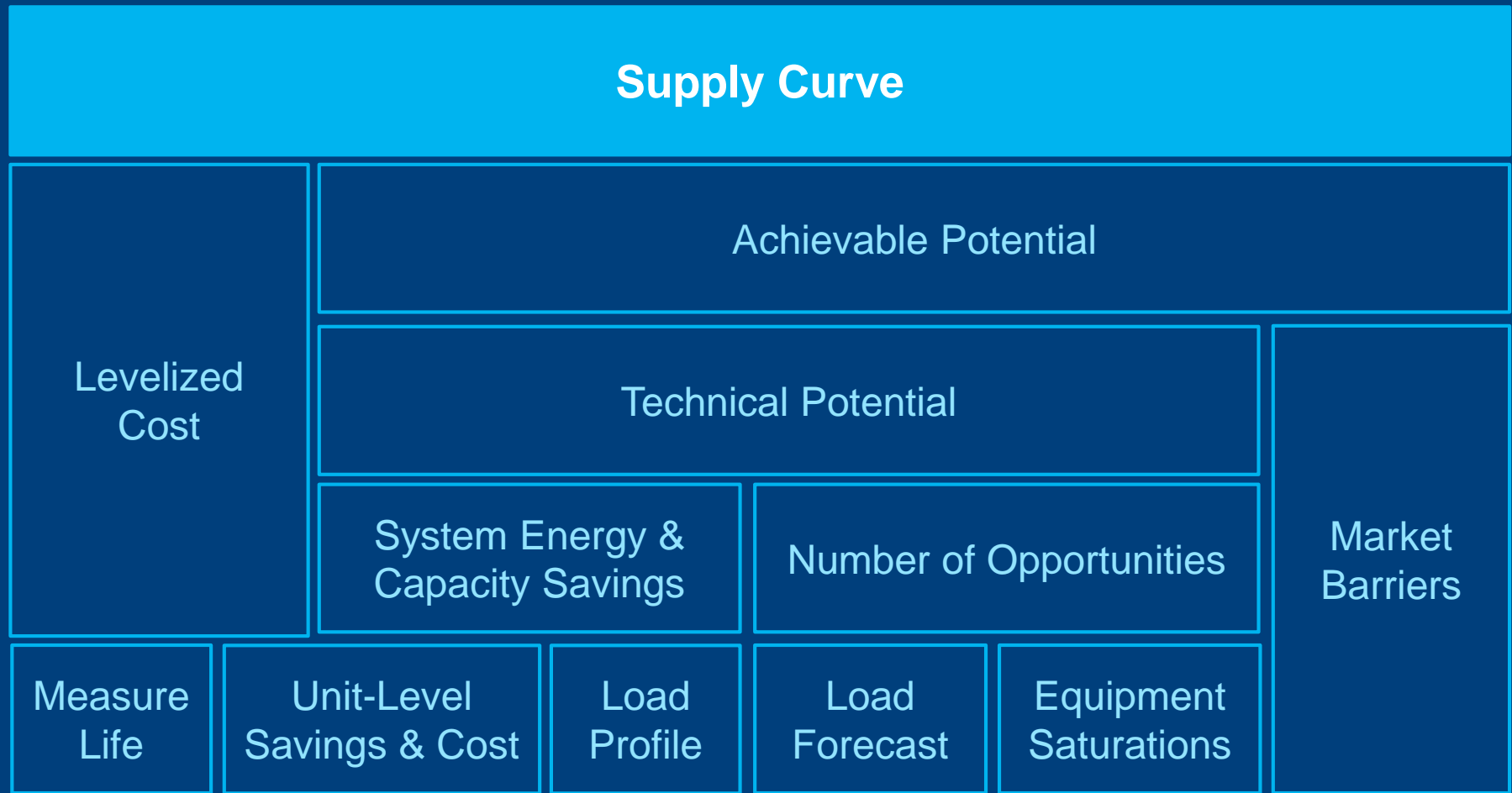
Resource  
Program

BPA EE Action  
Plan

# Overall Picture



# What's in a supply curve file?



# Types of Potential

Determined in Supply Curves	Not Technically Feasible	Technical Potential		
	Not Technically Feasible	Market Barriers	Achievable Technical Potential	
Council's RPM Model	Not Technically Feasible	Market Barriers	Not Cost- Effective	Achievable Economic Potential

# BPA vs. Regional Scenario

The 2021 Power Plan will include several scenarios:

Early Coal  
Retirements

Robustness of  
Energy Efficiency

Greenhouse Gas  
Tipping Points

Paths to  
Decarbonization

Increased  
Reliance on  
Extra-Regional  
Markets

Organized  
Energy and  
Capacity Markets

BPA Portfolio  
Optimization

BPA's target will be set from the BPA scenario and other regional modelling. This presentation focuses on the potential quantified for regional scenario analyses.



# New to the 2021 Plan

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Climate change weather modelling



Increased adoption of air conditioning



New state-level efficiency standards



Shipment-based methods for quantifying potential

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# Disclaimer

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This presentation is BPA's interpretation of the Council's work.

We used the DRAFT supply curve files published on Council's website as of June 12, 2020. We have done our own summaries and analysis of the data.

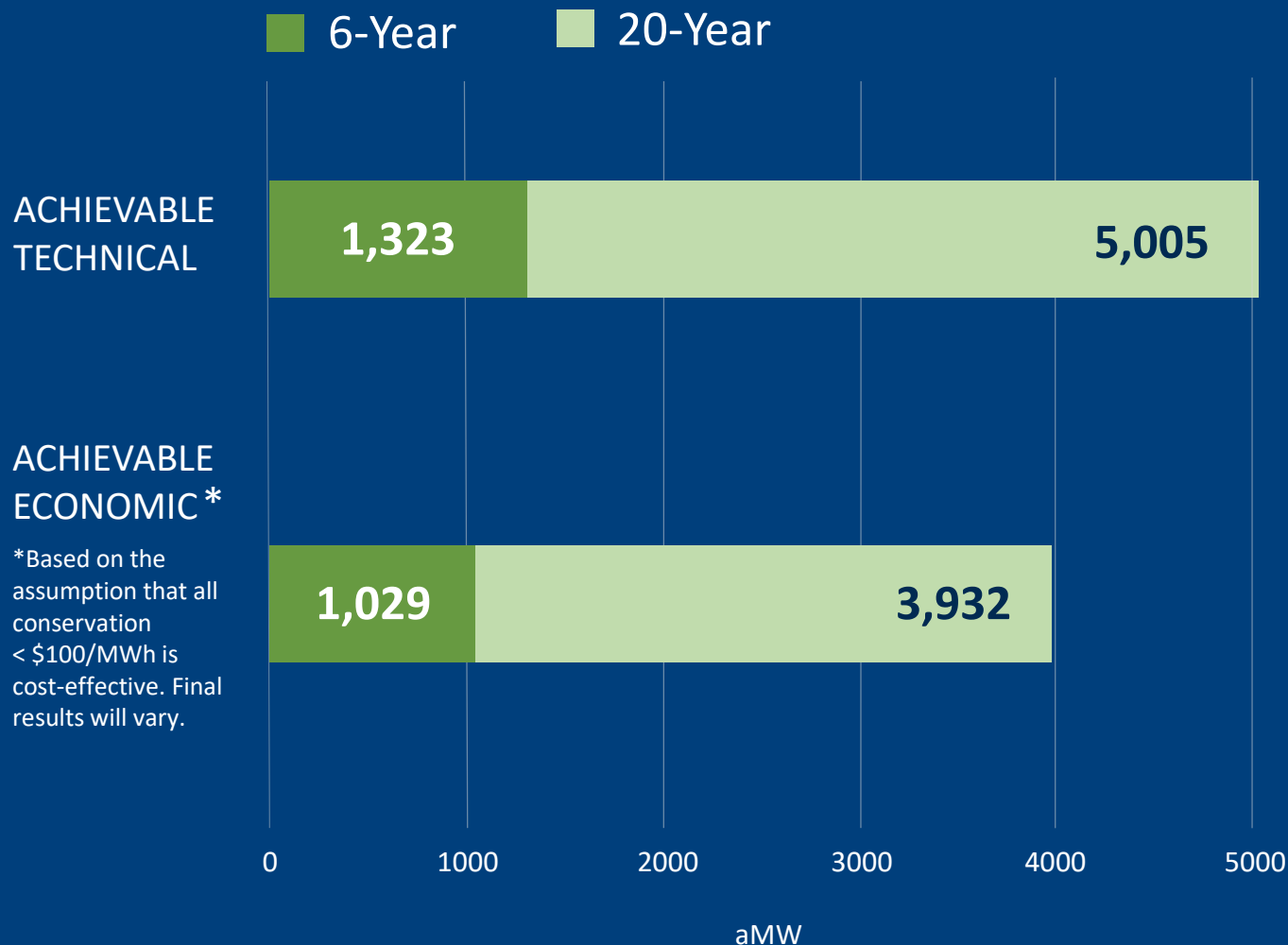
Council staff have shared many presentations on results at both the advisory committee and the full Council meetings – they can be found at the Council's website: <https://www.nwcouncil.org/2021-northwest-power-plan>.

**The economic screen presented in these slides is provided for informational purposes only and is not intended to suggest outcomes of the 2021 Power Plan.**



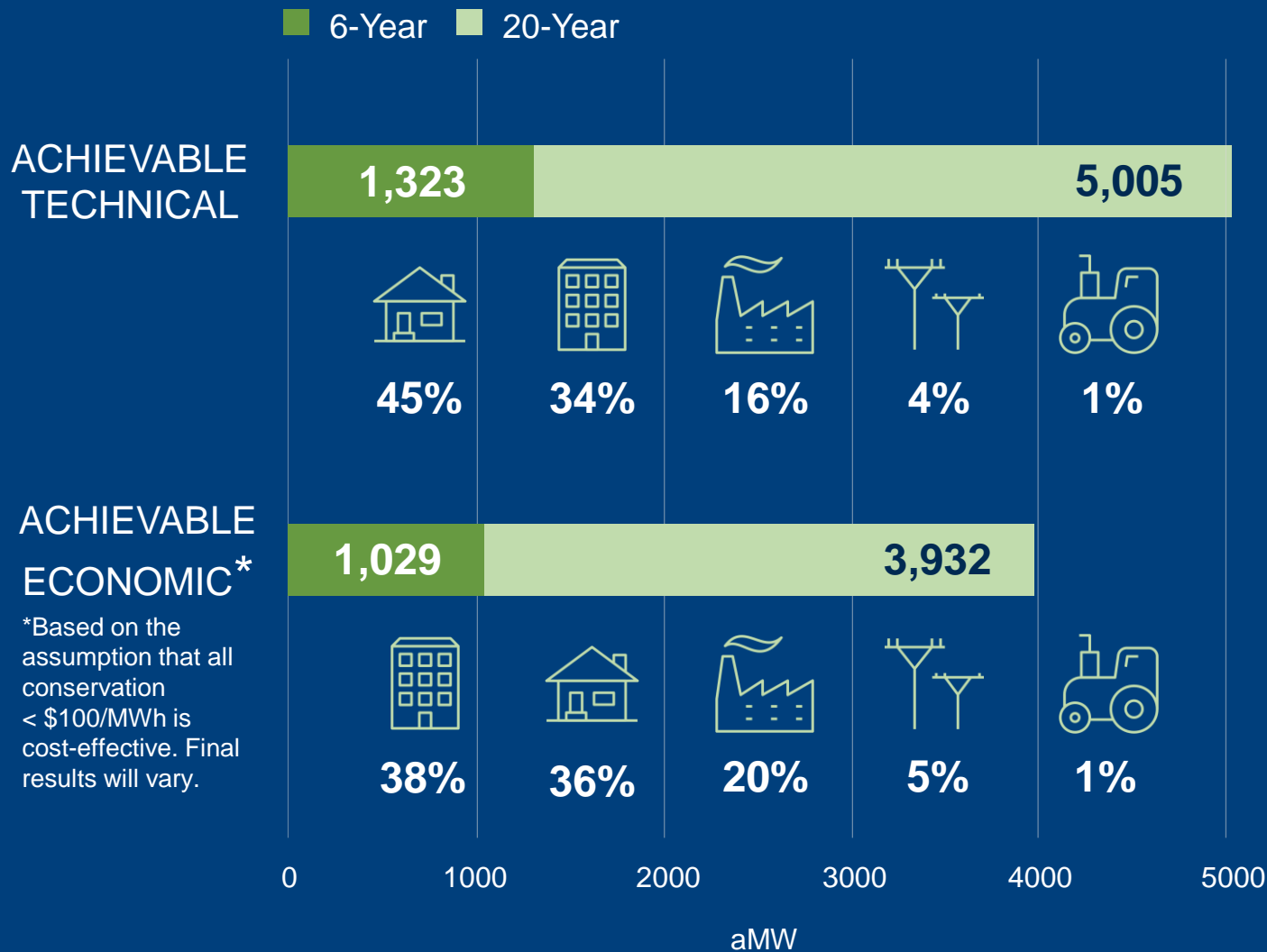
# DRAFT 2021 PLAN RESULTS

# Summary



Overall, lower levels of potential relative to 7<sup>th</sup> Power Plan

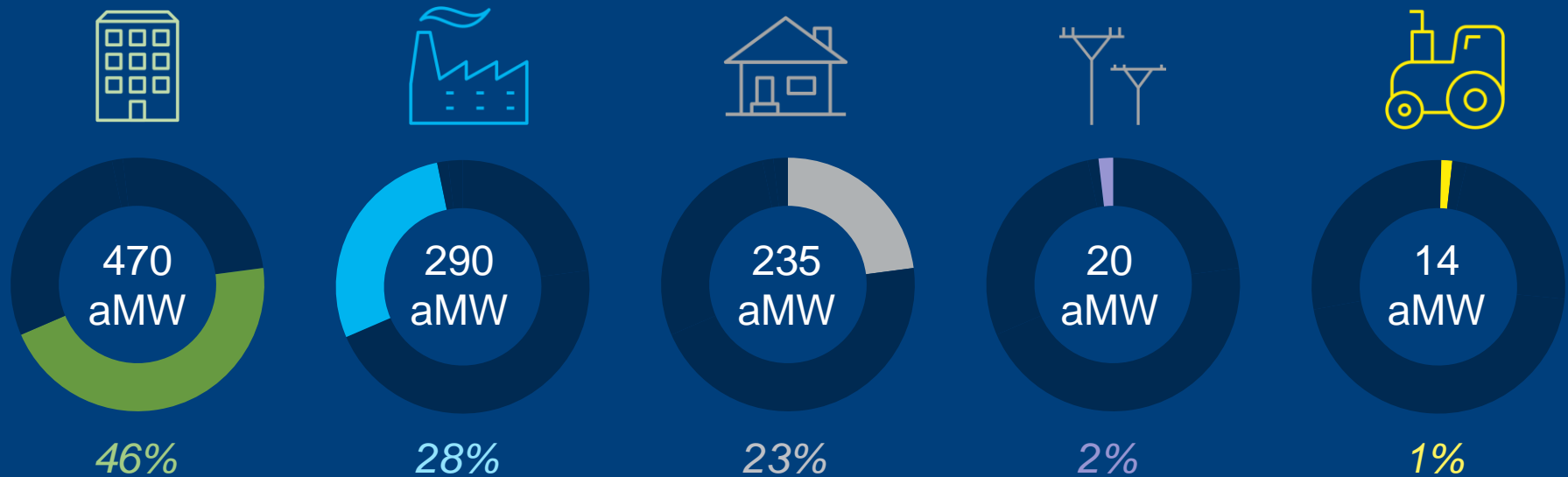
# Regional Potential



**Residential potential** makes up a large share of the achievable technical potential, but much of it is expensive and does not pass the assumed economic screen.

# Regional Draft Economic Achievable Potential by Sector

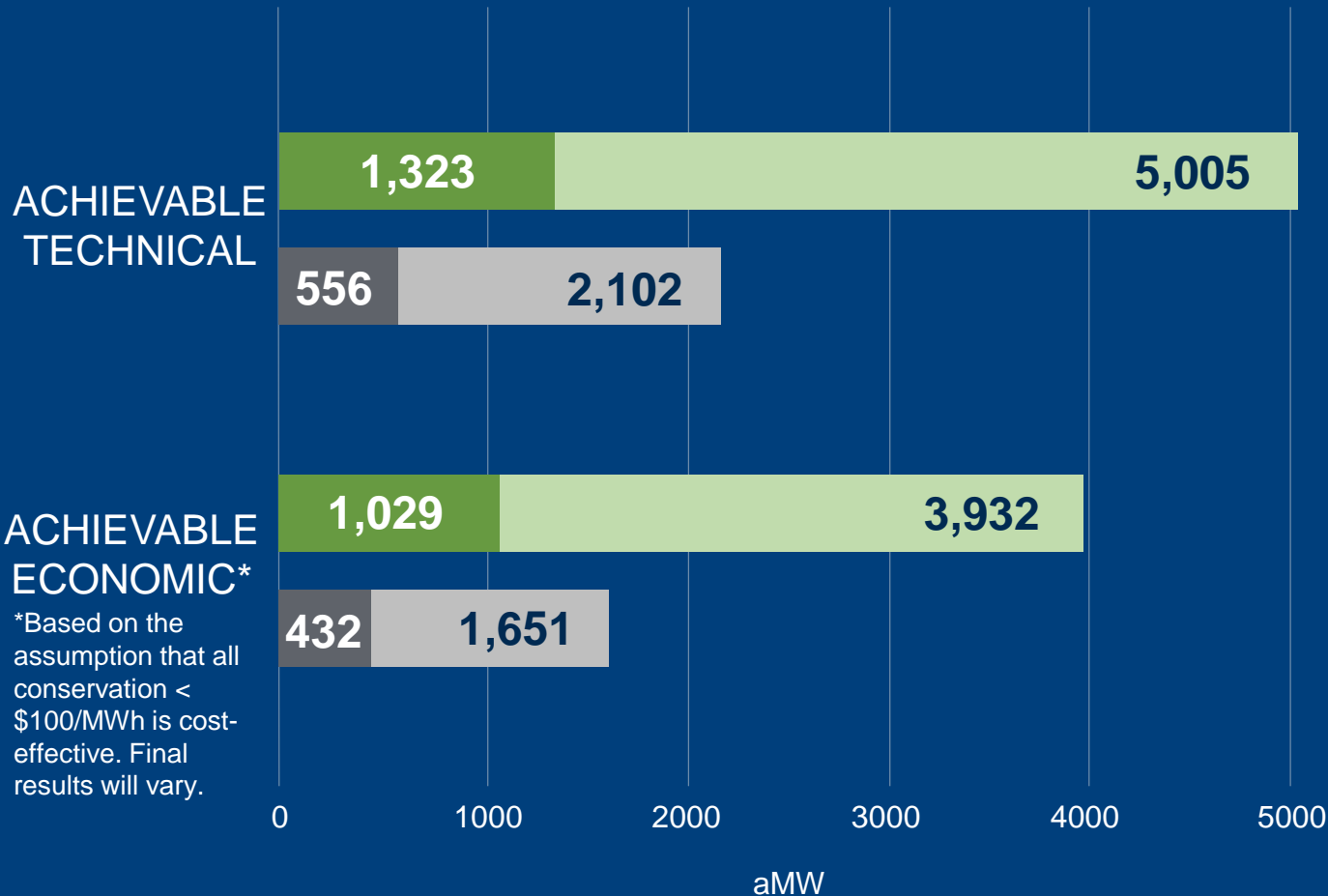
## 6-YEAR DRAFT ECONOMIC POTENTIAL



6-YEAR ECONOMIC POTENTIAL IS **78%**  
OF 6-YEAR TECHNICAL POTENTIAL

# 42% Share of Regional Potential

■ Regional 6-Year      ■ Regional 20-Year  
■ 42% Share of 6-Year    ■ 42% Share of 20-Year



**COMPARED  
TO 7<sup>th</sup> POWER  
PLAN**

**21% decrease in  
6-year achievable  
technical  
potential**

**32% decrease in  
6-year achievable  
economic  
potential**

# Key Takeaways



**Residential** economic potential is now comprised of more expensive measures with slower ramp rates and shifts from making up **23%** of the overall potential in first 6 years to making up **36%** of potential in 20 years.



Even with declines in lighting, HVAC, and data center measures, the **Commercial** sector has the **greatest** economic potential throughout study horizon. In the long term, the potential has shifted from lighting to HVAC measures.



The economic potential in the **Industrial** sector is largely comprised to retrofit measures which can be achieved early. The potential is **greater in first years of study** than in later years.



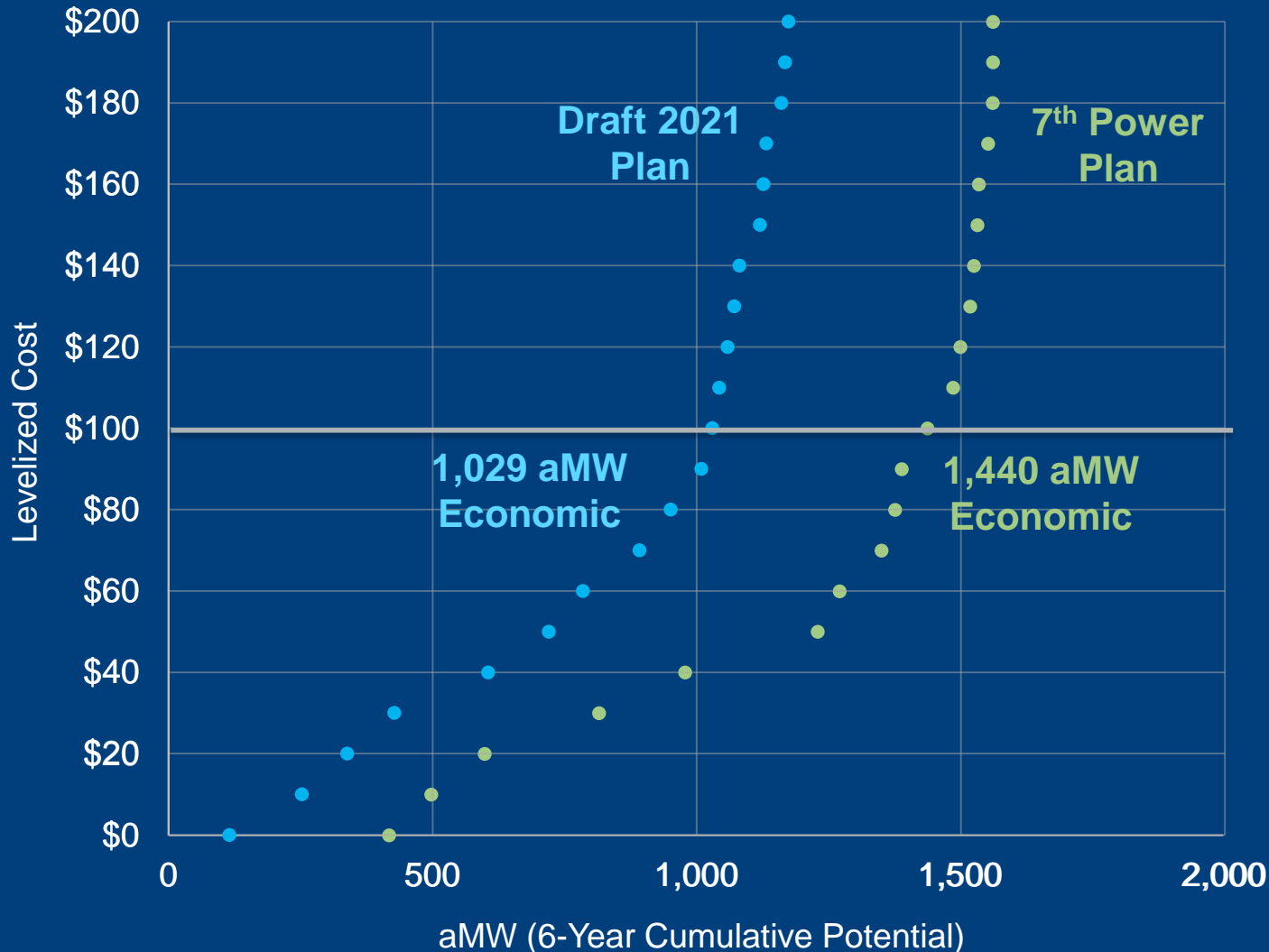
**Agricultural** economic potential is given slower ramp rates and remains **proportionally the same** throughout potential study.



Distribution efficiency measures were given a slow ramp rate. Most of the **Utility** economic potential is available **after the first 6 years** of the study.



# 6-Year Supply Curve



Overall, the Draft 2021 Plan has **less** 6-year potential **at each levelized cost**

Economic Levelized Cost Threshold (<100 \$/MWh)

# RESIDENTIAL SECTOR

# Residential Overview

- **11** new measure workbooks, including new cooling measures
- **2,262 aMW** of Technical Achievable potential
- Technical Achievable potential is **20% less** than 7<sup>th</sup> Power Plan Technical Achievable potential
- **HVAC** measures make up **nearly 50%** of residential potential due, in part, to new measures
- Greater than **80% decrease** in **lighting** potential compared to the 7<sup>th</sup> Power Plan over the 20-year period due to changing baseline and state standard in WA



# New Residential Measures

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- Efficient ultra-high definition televisions
  - Cooling only measures
    - Central AC
    - Room AC
    - Whole-house fans
  - Cellular shades
  - More efficient well pumps
  - Air cleaners
  - Domestic hot water circulator pumps
  - Hot water pipe insulation
  - Thermostatic shower restriction valves
  - Low-e storm windows
  - Well pumps
-

# Regional Residential Economic Potential\*



**235 aMW**

6-YEAR DRAFT ECONOMIC  
POTENTIAL

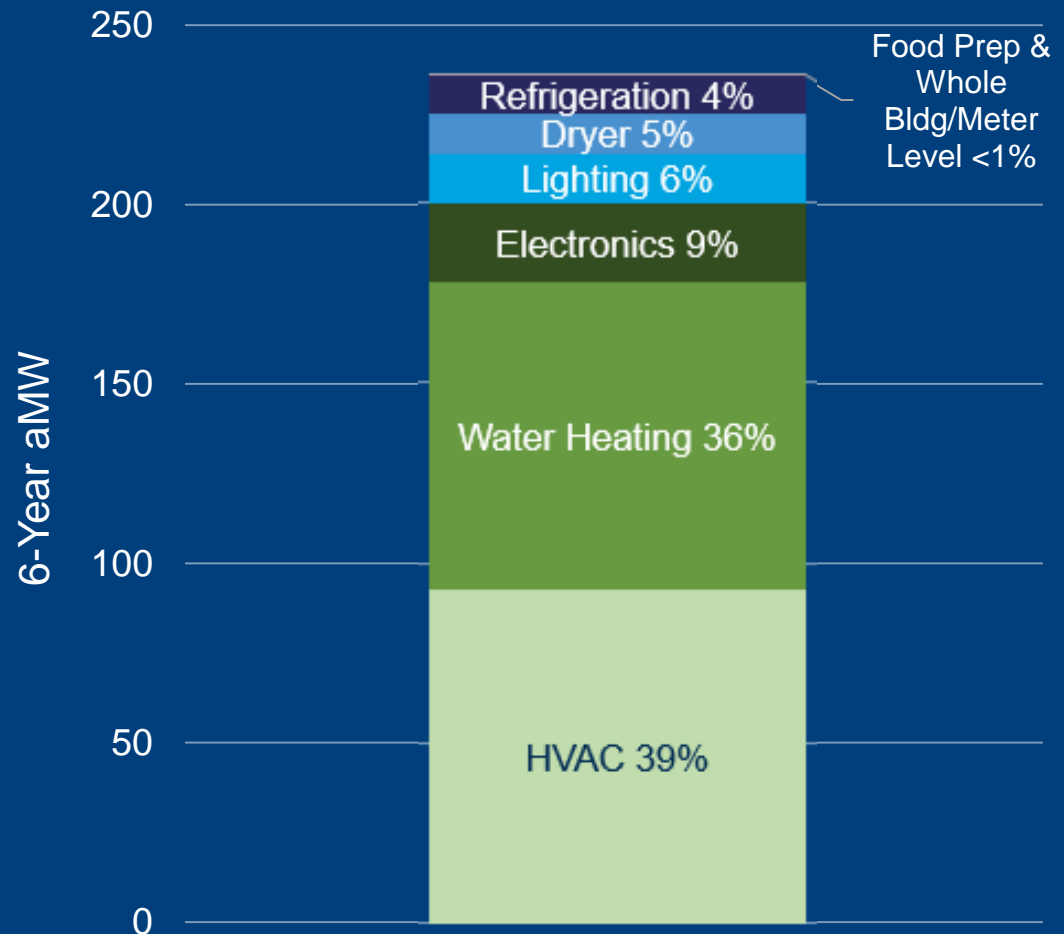
*50% of Technical Potential (471 aMW)*

**1,411 aMW**

TOTAL DRAFT ECONOMIC  
POTENTIAL

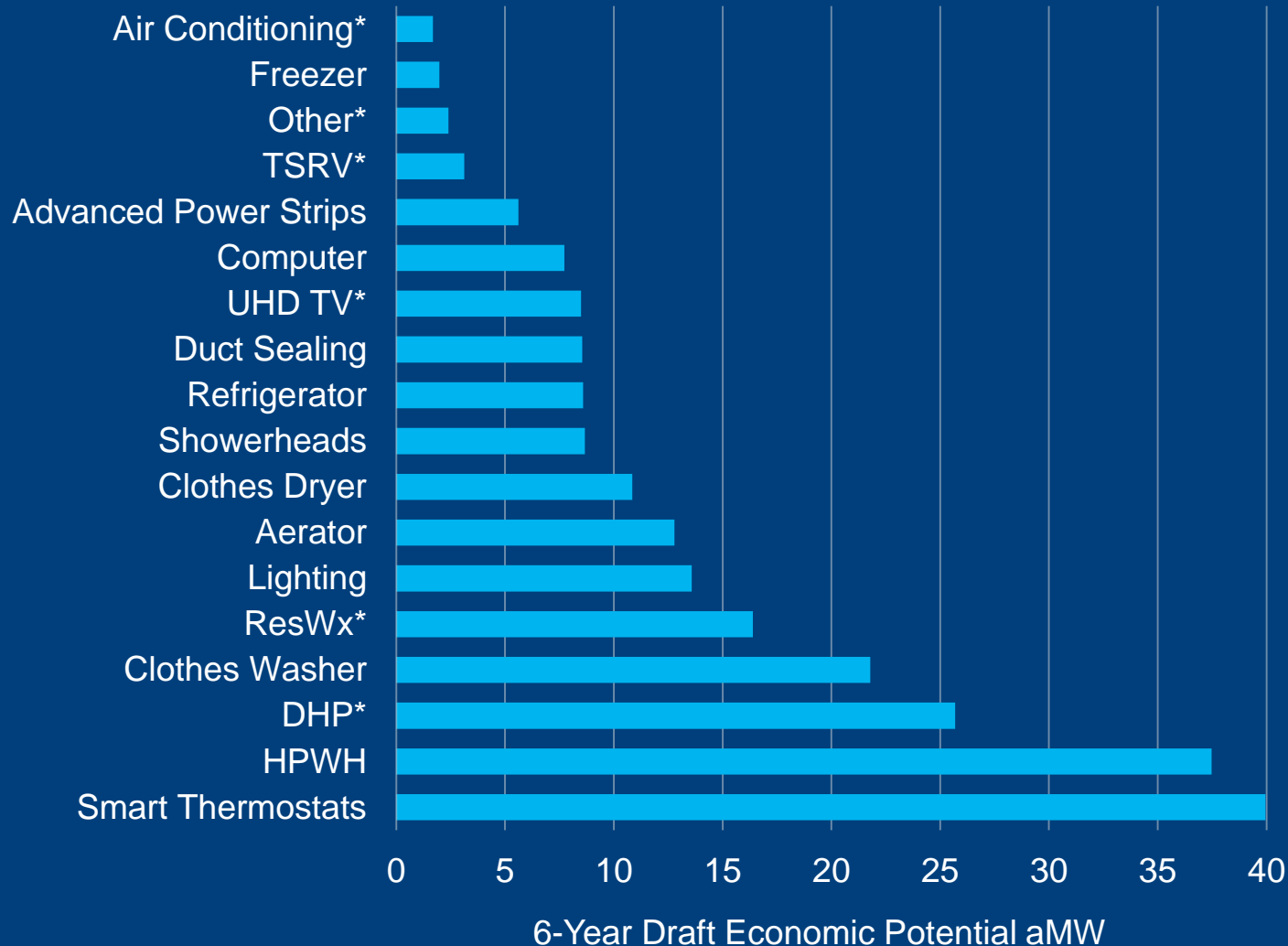
*62% of Technical Potential (2,262 aMW)*

HVAC measures new to  
the Draft 2021 Plan  
cause an increase in  
overall HVAC savings



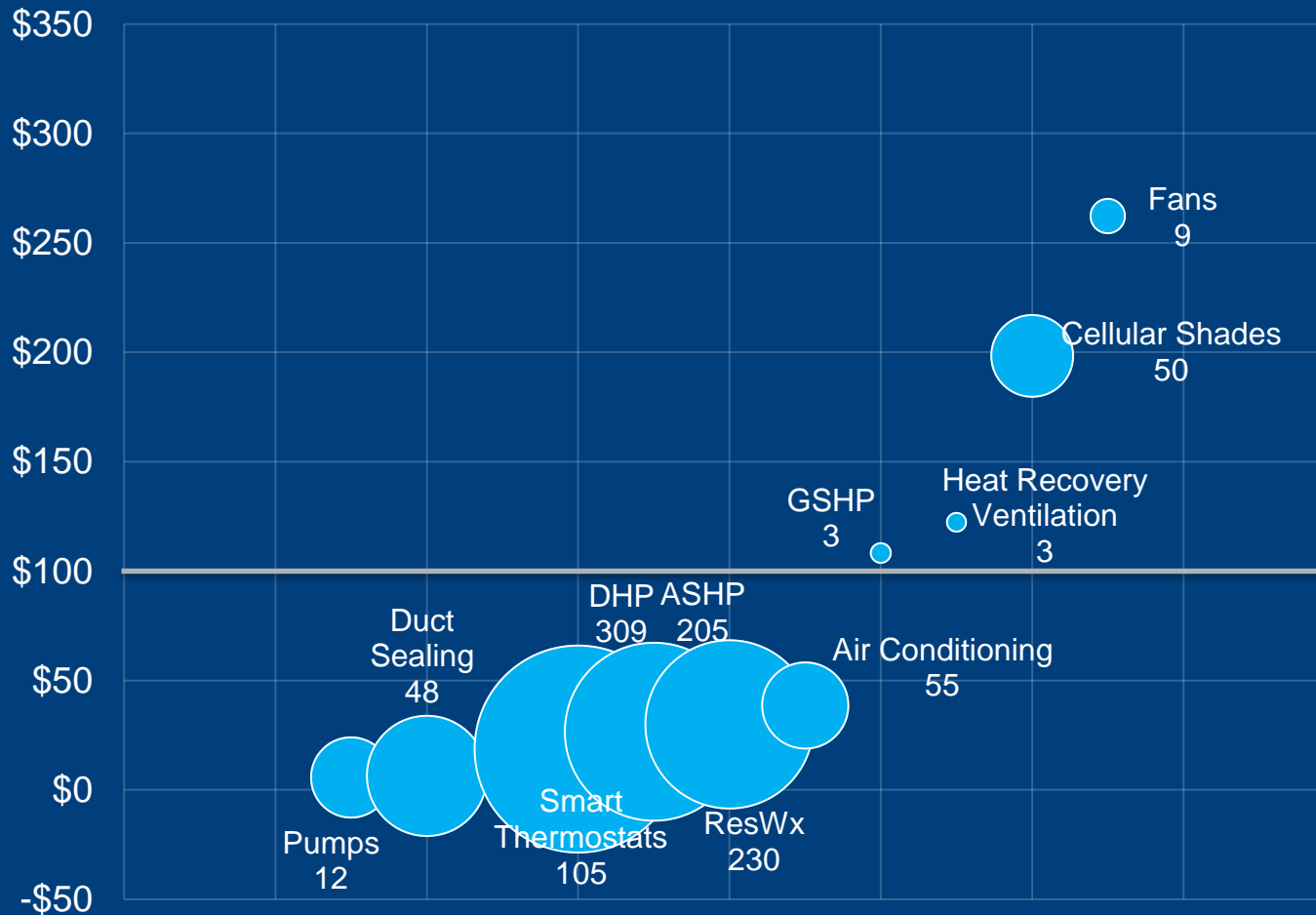
\*Economic potential is based on the assumption that all conservation < \$100/MWh is cost-effective. Final results will vary.

# Top Residential Measure Categories



**Smart  
thermostat  
savings are  
10x greater  
than in the 7<sup>th</sup>  
Power Plan**

# Cost Effectiveness of Residential HVAC Measures



**New measures** such as **whole house fans** and **cellular shades** have **highest** levelized costs

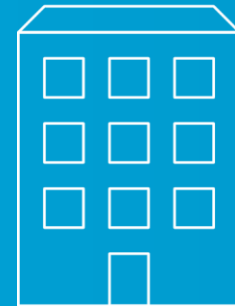
Labels values are 20-Year Technical Achievable aMW

# COMMERCIAL SECTOR



# Commercial Overview

- **12** new measure workbooks
- **1,702 aMW** of Technical Achievable potential
- Technical Achievable potential is **37% less** than 7<sup>th</sup> Power Plan Technical Achievable potential
- **Lighting** measures potential decreased by **50%** compared to the 7<sup>th</sup> Power Plan
- Over a **90% decrease** in **electronics** potential compared to the 7<sup>th</sup> Power Plan

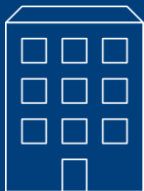


# New Commercial Measures

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- Fans
  - VHE-DOAS
  - VRF-DOAS
  - Chillers
  - Heat pumps
  - Package terminal heat pumps
  - Unitary air conditioning
  - Commercial efficient pumps
  - Engine block heaters
  - Elevator efficiency
  - Refrigeration door to display cases
  - Refrigeration auto door closers
  - Standalone refrigerators and freezers
  - Ice makers
  - Refrigerated vending machines
  - Circulation pump
  - Hot water controls
  - Thin triple pane windows
  - Applied film windows
  - Heat pump water heaters
  - Griddles
  - Overwrapper
-

# Regional Commercial Economic Potential\*



**470 aMW**

6-YEAR DRAFT ECONOMIC  
POTENTIAL

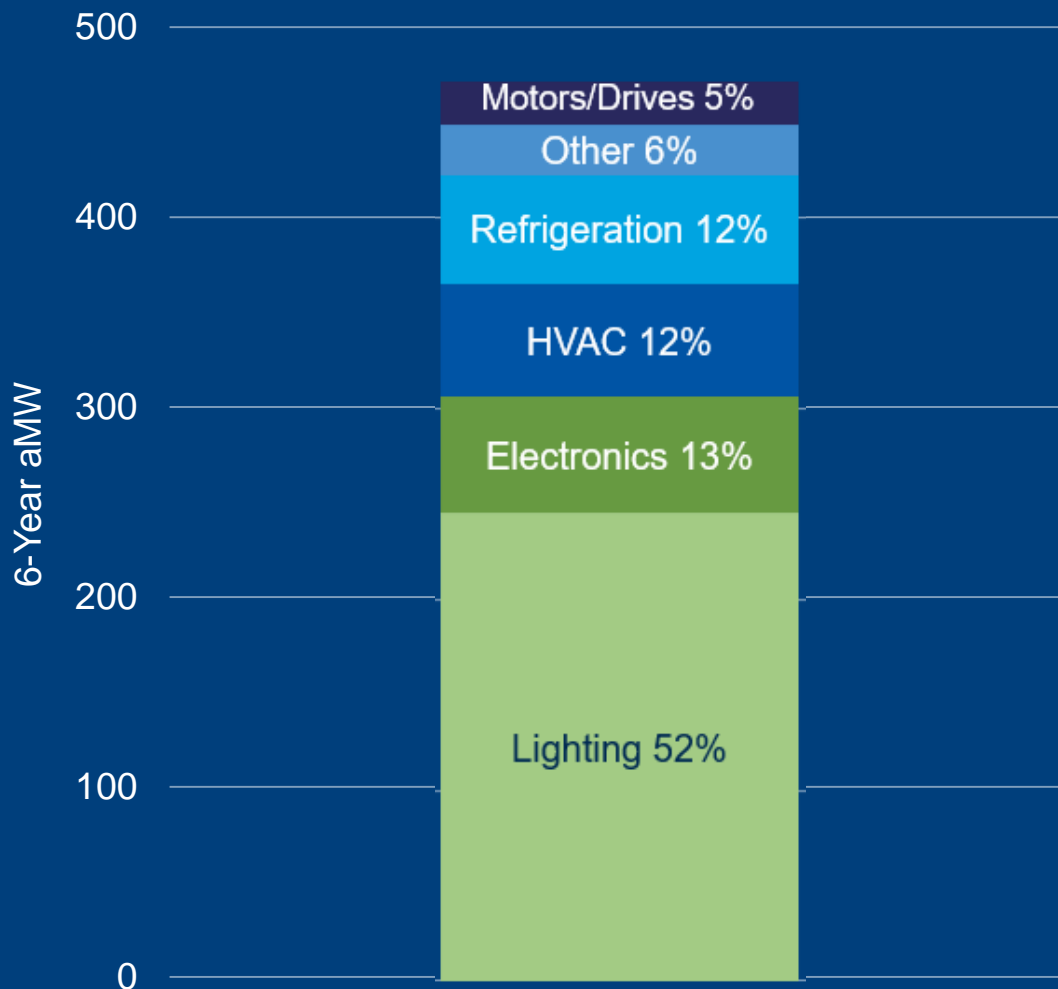
*90% of Technical Potential (522 aMW)*

**1,503 aMW**

TOTAL DRAFT ECONOMIC  
POTENTIAL

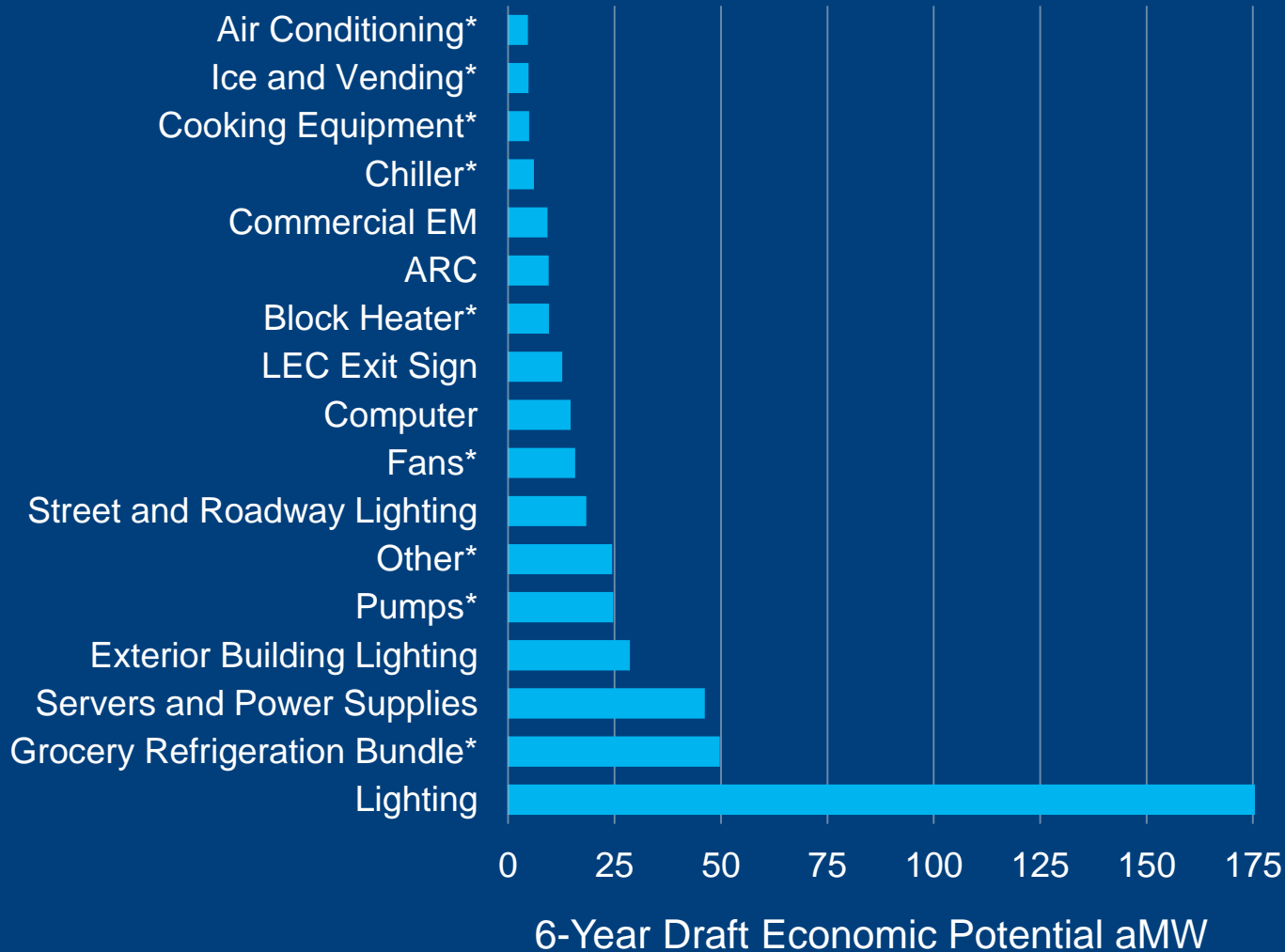
*62% of Technical Potential (1,702 aMW)*

**Lighting** and **Electronics** saw  
the **greatest declines** in 20-year  
potential compared to the 7<sup>th</sup>  
Power Plan but makeup **largest**  
portion of potential



\*Economic potential is based on the assumption that all conservation < \$100/MWh is cost-effective. Final results will vary.

# Top Commercial Measure Categories



Significant categories with new measures include **Grocery Refrigeration Bundle, Pumps, and Fans**

# INDUSTRIAL SECTOR

# Industrial Overview

- **783 aMW** of Technical Achievable potential
- Technical Achievable potential is **35% greater** than 7<sup>th</sup> Power Plan Technical Achievable potential
- **Increase** in potential is a result of **new methodology** for estimating some industrial measures and **additional lighting potential**



# New Industrial Measures

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- General HVAC measure
  - Wastewater and water supply (moved from commercial)
  - Forklift battery charger
  - Hydraulic power units for pulp mills
  - New methodology for compressors, fans, pumps, other motor-driven systems
-

# Regional Industrial Economic Potential\*



**290 aMW**

6-YEAR DRAFT ECONOMIC  
POTENTIAL

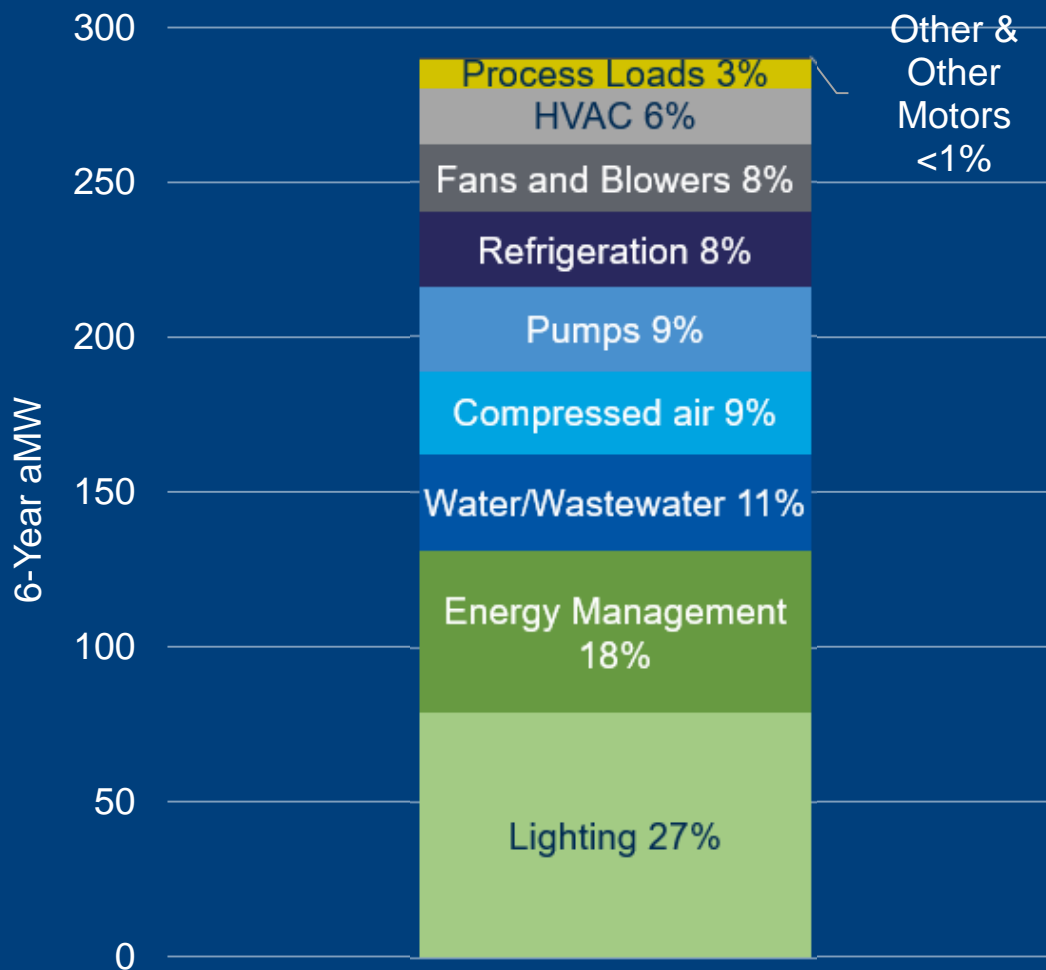
*Almost 100% of Technical Potential  
(291 aMW)*

**778 aMW**

TOTAL  
DRAFT ECONOMIC POTENTIAL

*99% of Technical Potential (783 aMW)*

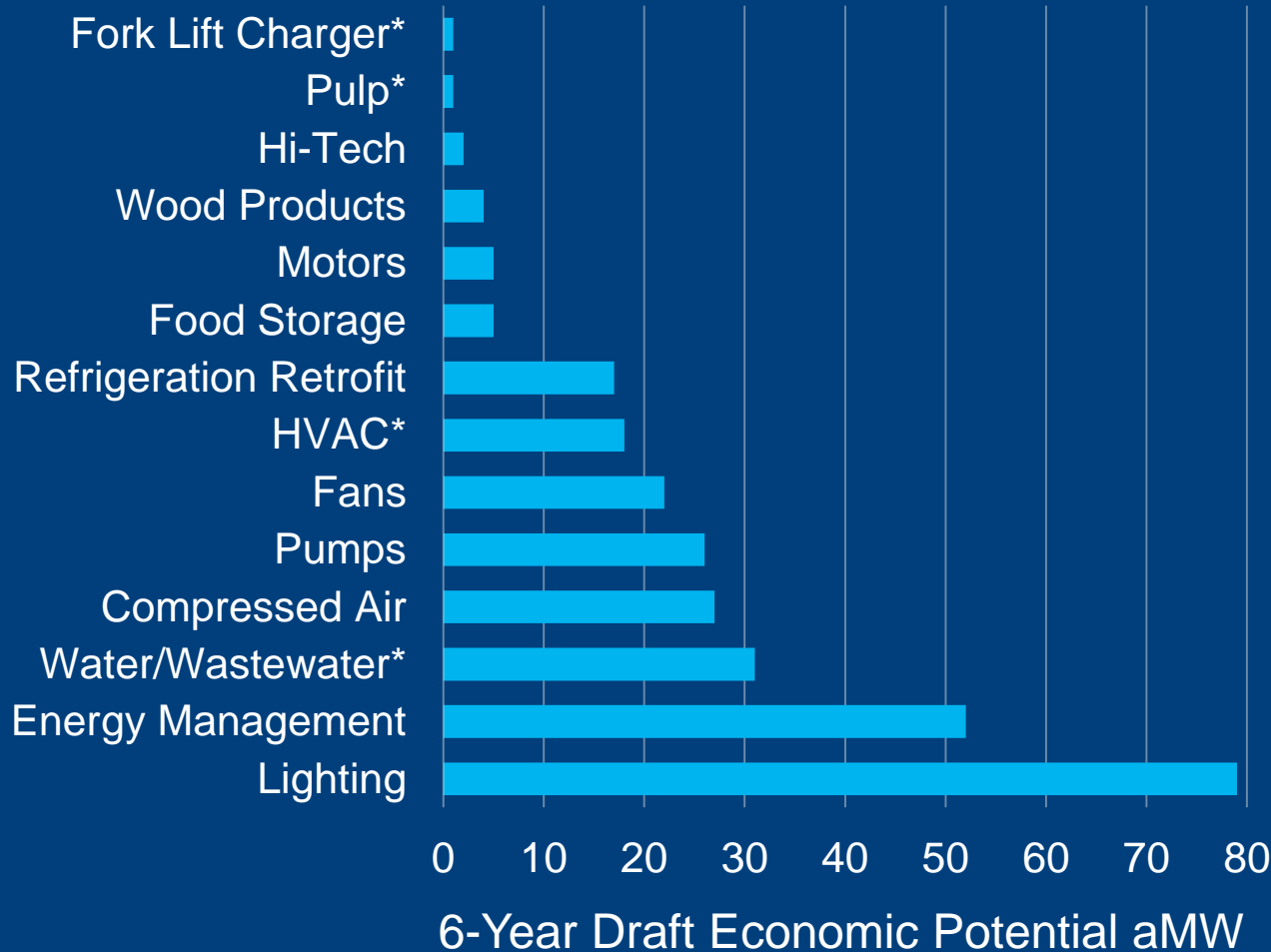
**Lighting** potential is nearly  
**double** 7<sup>th</sup> Power Plan due  
to changes in assumptions



\*Economic potential is based on the assumption that all conservation < \$100/MWh is cost-effective. Final results will vary.



# Top Industrial Measure Categories

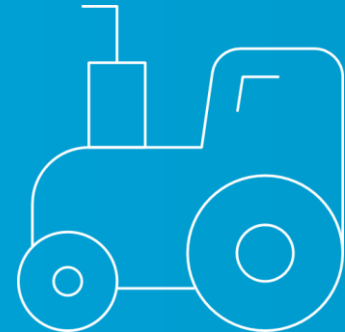


New measures with the **largest** impacts are **HVAC** measures and **water supply & wastewater**

# AGRICULTURAL SECTOR

# Agricultural Overview

- **73 aMW** of Technical Achievable potential
- Technical Achievable potential was **82% less** than 7<sup>th</sup> Power Plan Technical Achievable potential
- **Decrease** in potential is a result of the **exclusion of Scientific Irrigation Scheduling (SIS)** due to recent program evaluation

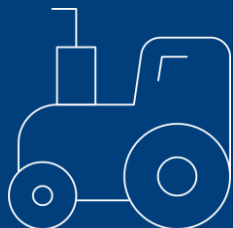


# New Agricultural Measures

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- Freeze-resistant stock tanks
  - Generator block heaters
  - Variable rate irrigation
  - Fans
-

# Regional Agricultural Economic Potential\*



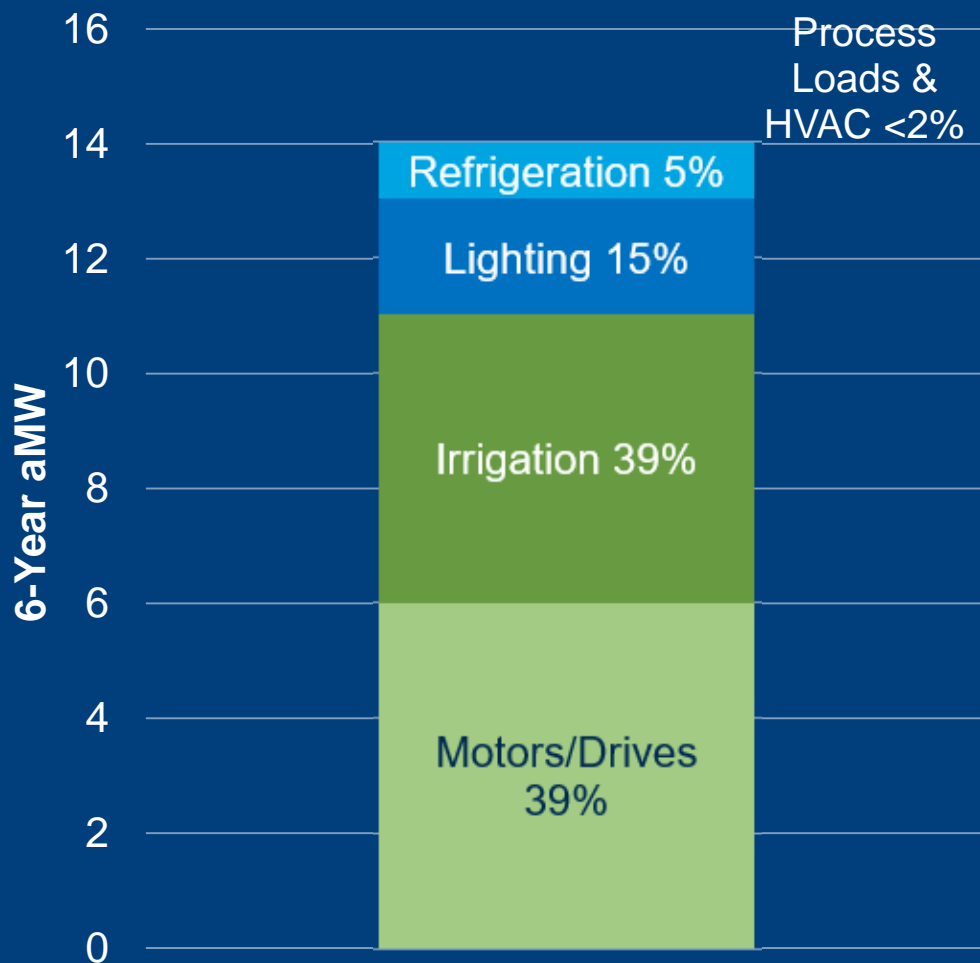
**14 aMW**

6-YEAR  
DRAFT ECONOMIC POTENTIAL  
*79% of Technical Potential (18 aMW)*

**53 aMW**

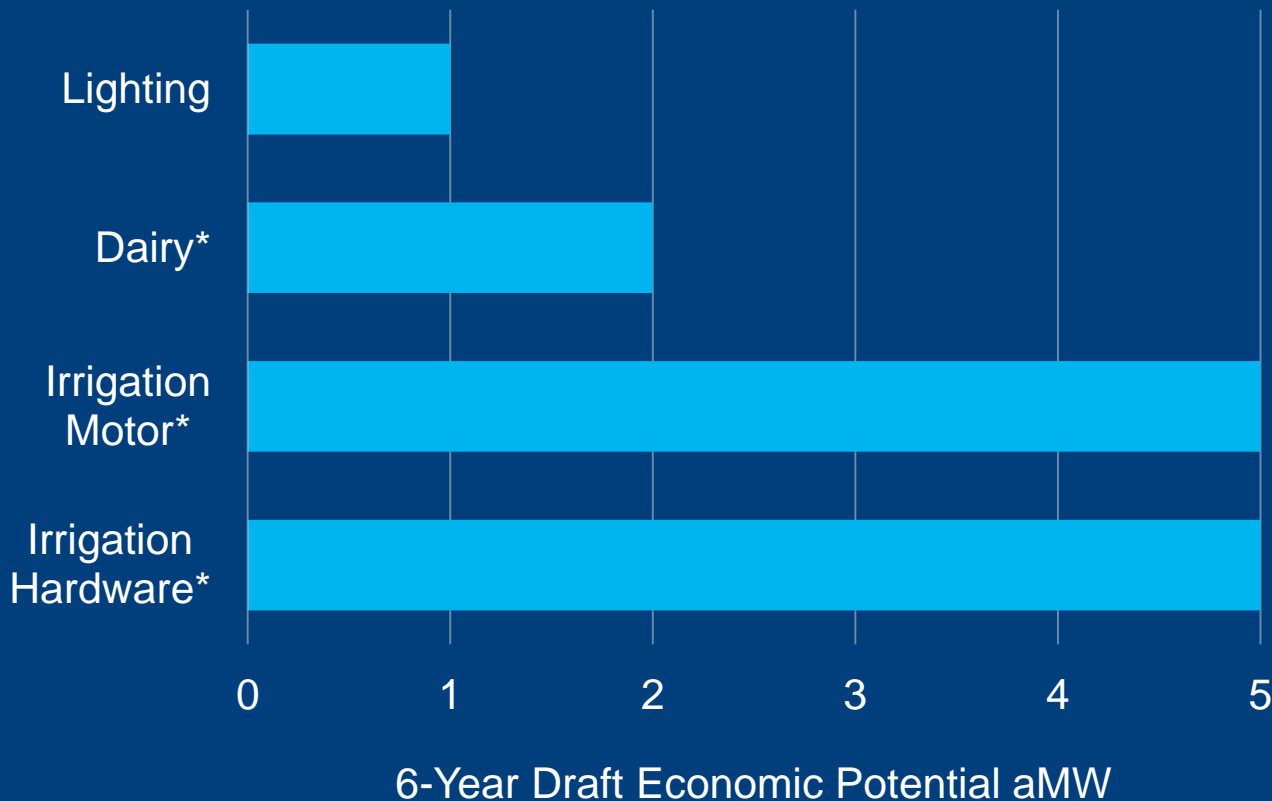
TOTAL  
DRAFT ECONOMIC POTENTIAL  
*73% of Technical Potential (73 aMW)*

**New measures added  
for motors and  
drives, HVAC**



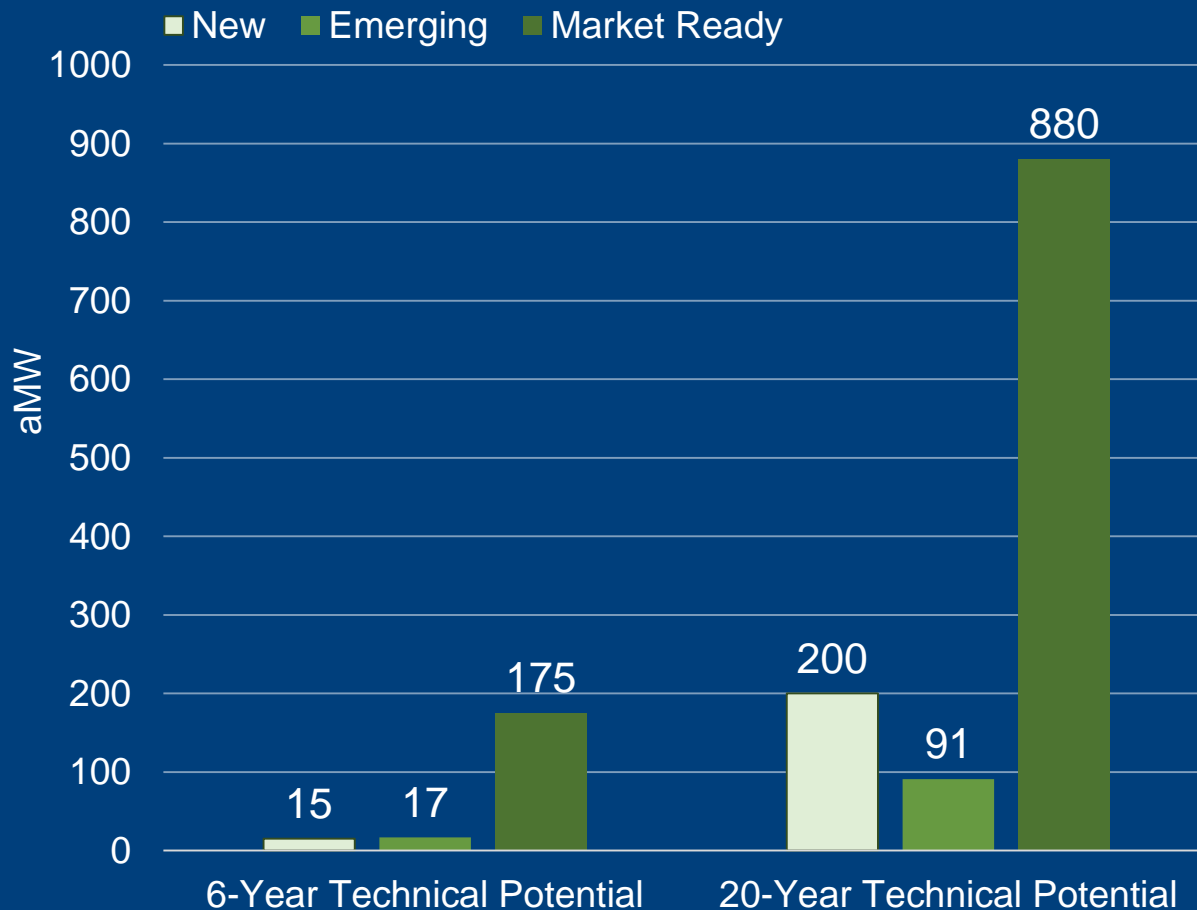
\*Economic potential is based on the assumption that all conservation < \$100/MWh is cost-effective. Final results will vary.

# Top Agricultural Measure Categories



**Majority of measures are cost-effective, with Irrigation Hardware measures having the smallest percentage of cost-effective measures**

# New Measures in 2021 Plan



**207 aMW**

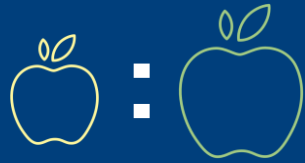
6-YEAR  
TECHNICAL POTENTIAL  
*16% of Measure Total 6-Year  
Technical Potential (1,323 aMW)*

**1,171 aMW**

20-YEAR  
TECHNICAL POTENTIAL  
*23% of Measure Total 6-Year  
Technical Potential (5,005 aMW)*

**Most of the potential  
from new measures  
added to 2021 Plan is  
from measures that **are  
market ready.****

# Major Takeaways: Part I



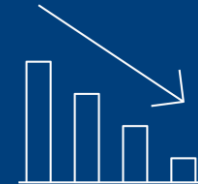
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**20-year  
technical  
achievable  
potential is  
74%** of the  
7<sup>th</sup> Power Plan



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**78%**  
of the 6-year  
potential is  
economic at  
\$100/MWh. 90%  
of the 7<sup>th</sup> Power  
Plan potential  
was economic.

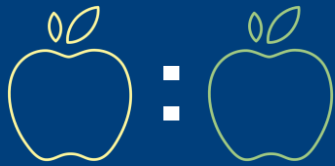


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**Total  
estimated  
6-year  
economic  
potential is  
1,029 aMW,**  
compared to 1,400  
aMW from the  
7<sup>th</sup> Power Plan



# Major Takeaways: Part II



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**Res 2021 Plan  
potential  
is 20% less**  
than 7<sup>th</sup> Power Plan



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**Ag is down  
Industrial is up**  
compared to 7<sup>th</sup> Power  
Plan potential. Industrial  
was the only sector to  
increase.



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**Commercial**  
**2/3** of 7<sup>th</sup> Power  
Plan potential

# Major Takeaways: Part III



**20% Less**

Lighting Baselines | State Standards



**33% Less**

Lighting Baselines | Embedded data centers



**35% More**

New methodology for pumps, compressors, etc.



**82% Less**

No Scientific Irrigation Scheduling



Lower T&D Capacity Deferral Values



New 2021P measures contribute less to total savings than new measures in previous Power Plans



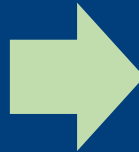
# NEXT STEPS

# Draft 2021 Plan Results

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Draft results ready at the  
end of September 2020

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Draft Plan complete in  
February 2021

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BPA-developed Power Plan resources, including this presentation and a workbook summarizing the energy-efficiency supply curves, are available here:

[www.bpa.gov/EE/Utility/toolkit/Pages/2021-Power-Plan-Engagement.aspx](http://www.bpa.gov/EE/Utility/toolkit/Pages/2021-Power-Plan-Engagement.aspx)

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# QUESTIONS?

## CONTACT INFO

Jessica Aiona, BPA  
[jlaiona@bpa.gov](mailto:jlaiona@bpa.gov)

Lakin Garth, Cadmus  
[lakin.garth@cadmusgroup.com](mailto:lakin.garth@cadmusgroup.com)

Ted Light, Lighthouse  
[Ted@lighthouseenergynw.com](mailto:Ted@lighthouseenergynw.com)

Masumi Izawa, Cadmus  
[masumi.izawa@cadmusgroup.com](mailto:masumi.izawa@cadmusgroup.com)